Dec. 30, 1952 K. J. UNWIN 2,623,209

NAILING-IN-METAL MACHINE

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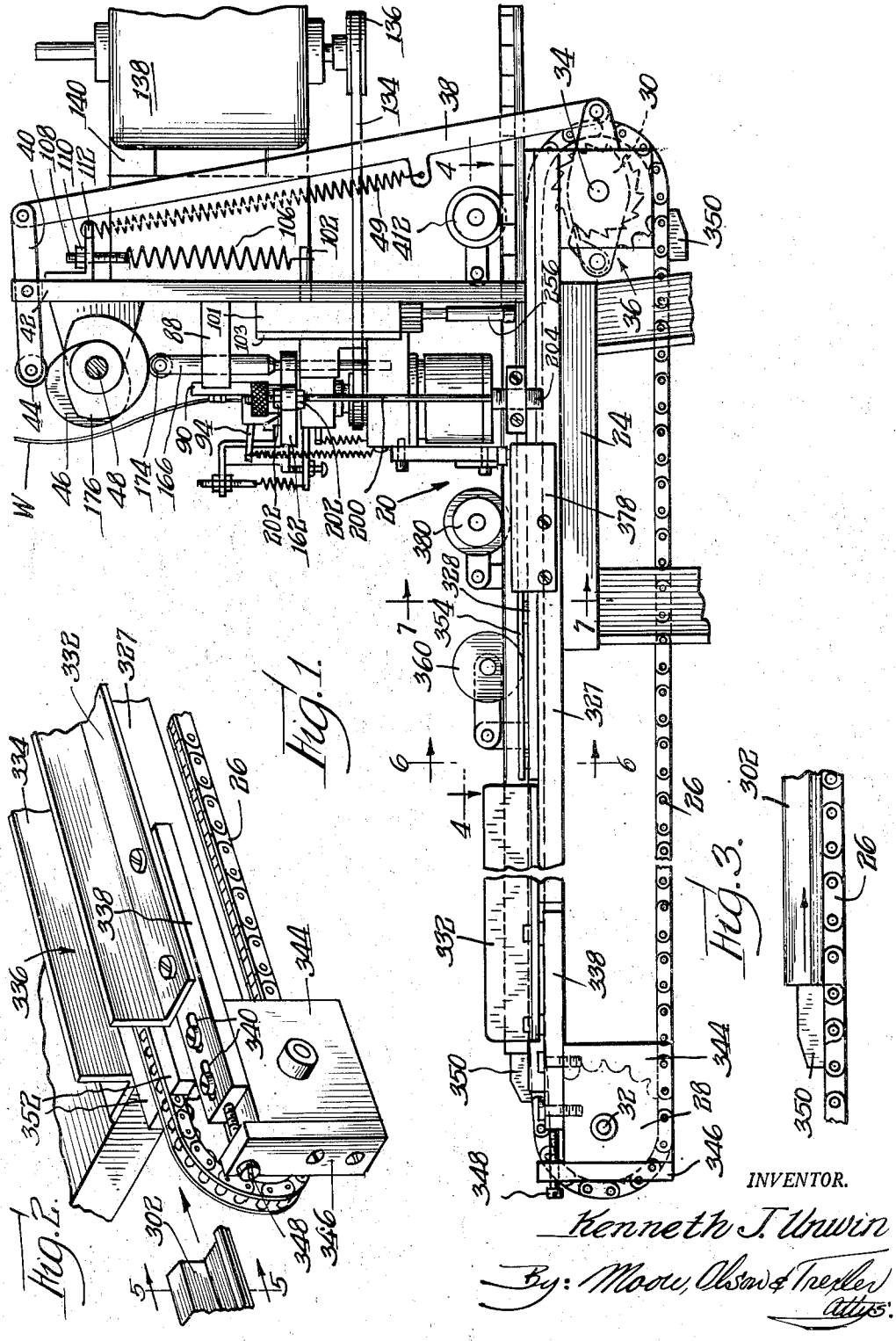


Fig. 1.

Fig. 2.

Fig. 3.

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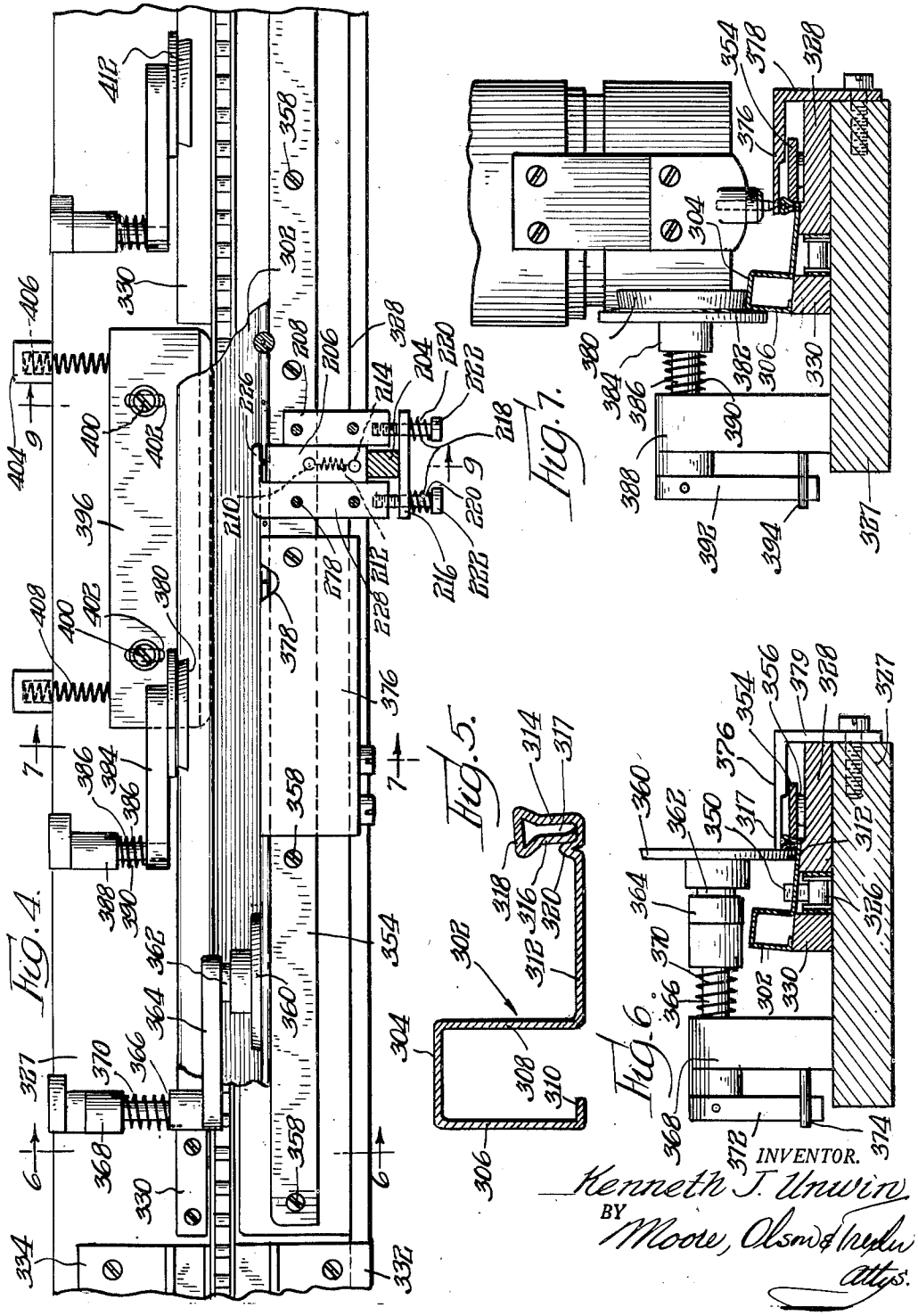
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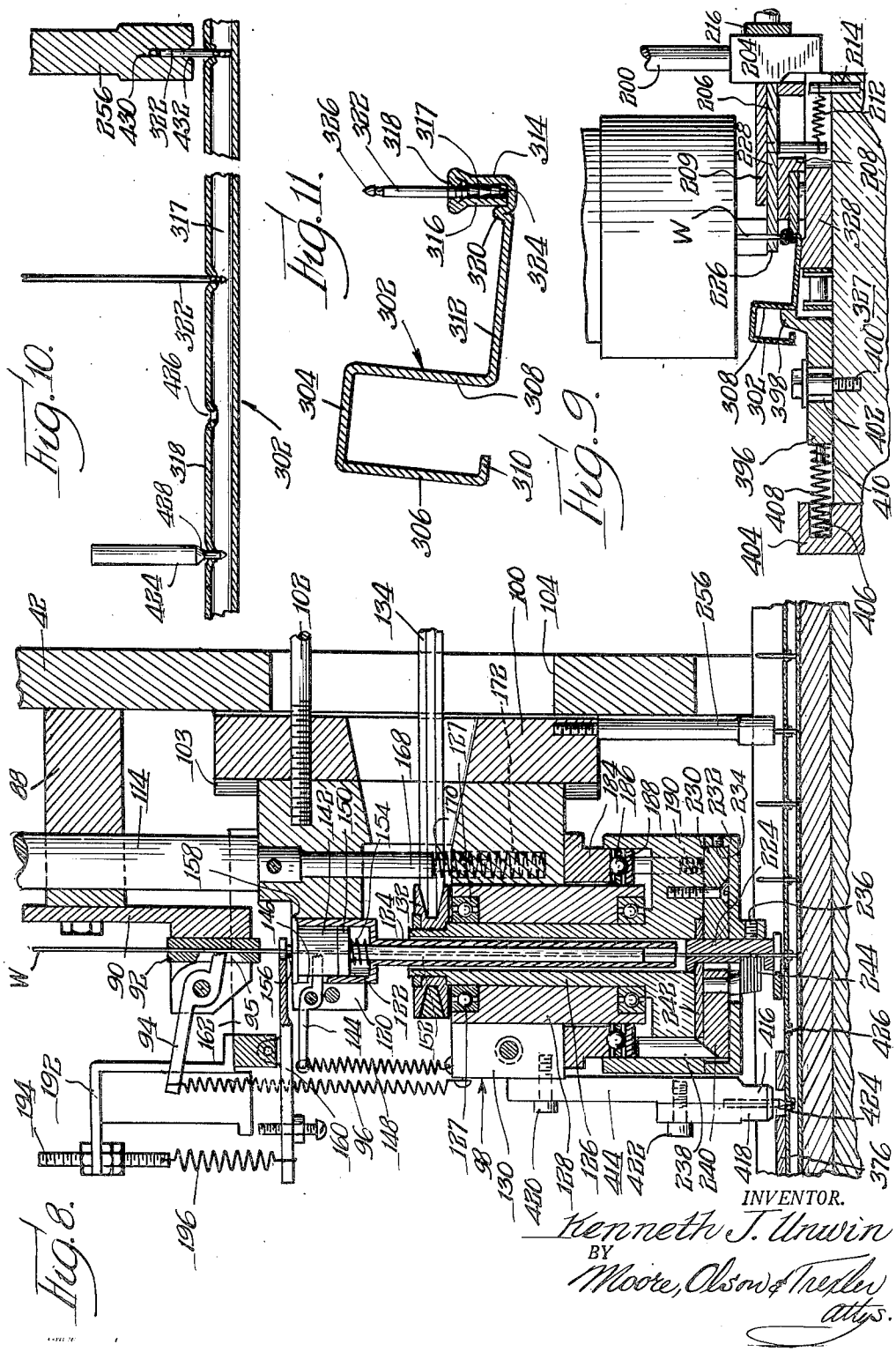


Fig. 8.

Fig. 10.

Fig. 11.

Fig. 9.

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NAILING-IN-METAL MACHINE

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Application March 20, 1950, Serial No. 150,573

2 Claims. (Cl. 1—1)

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This invention is concerned generally with the production and insertion of curtain impaling pins in a curtain stretcher frame member or molding and more particularly with the production and insertion of such pins in a metal frame member or molding.

Krah and Block, in their application, Serial Number 740,614, for "Pin Setting Machine and Method" filed April 10, 1947, now Patent Number 2,504,987, disclose means for forming pins from a length of wire while concurrently inserting the pins in a wooden stretcher molding. The mechanism disclosed by Krah and Block inserts a length of wire directly into a wooden curtain stretcher molding or similar member and periodically advances the molding by means of small teeth biting into the rear face of the molding. Stretcher moldings or similar members of metal or other hard materials cannot be handled by the mechanism disclosed in that application for they are substantially impenetrable by wire. As a result, wire cannot be inserted directly into them and teeth cannot bite into them to advance them. Metal stretcher moldings are more flexible than wooden moldings and are of different shape and consequently cannot be positioned and supported by mechanism adapted to operate on wooden moldings.

An important object of this invention is the provision of an improved pin setting machine for cutting pins from a length of wire and inserting the same into a metal curtain stretcher molding or other member of similar character.

A further object is the provision in a pin setting machine of means for advancing a metal curtain stretcher molding or other member of similar character without piercing or otherwise marking the molding or member.

A further object of this invention is the provision of a pin setting machine for piercing a hole in a metal curtain stretcher or other member of similar character, inserting a length of wire into the pierced molding, and cutting off the wire to leave a pin.

Yet another object of the invention is the provision in a pin setting machine as set forth in the foregoing object of means for aligning and for inserting pins to their full depth.

Other and further objects and advantages of the present invention will be apparent from the following description when taken in conjunction with the accompanying drawings. The invention is disclosed in full in the drawings but in certain instances reference characters similar to those in the Krah and Block application previously referred to are utilized in order that that application may be referred to for additional details if desired. In the drawings:

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Fig. 1 is a longitudinal elevation of a pin setting machine constructed in accordance with and embodying the principles of the invention;

Fig. 2 is a perspective view of the receiving end of the feeding mechanism with a stretcher molding about to be inserted;

Fig. 3 is a fragmentary view of a portion of the feeding mechanism showing its engagement with a stretcher molding;

Fig. 4 is a horizontal section along the line 4—4 of Fig. 1;

Fig. 5 is a cross section of a stretcher molding as taken along the line 5—5 of Fig. 2;

Fig. 6 is a cross section as taken along the line 6—6 of Fig. 1;

Fig. 7 is a cross section as taken along the line 7—7 of Figs. 1 and 4;

Fig. 8 is a vertical section through the pin driving mechanism;

Fig. 9 is a cross section along the line 9—9 of Fig. 4;

Fig. 10 is a longitudinal section through a stretcher molding showing the various operations performed by the pin setting mechanism; and

Fig. 11 is a cross section through a stretcher molding similar to that shown in Fig. 5 with a pin inserted.

The illustrations show a machine or portion of a machine capable of operating upon one stretcher molding at a time. It is contemplated that multiple stations and feeding mechanisms can be provided to operate concurrently upon any desired number of curtain stretcher moldings. As the additional parts would be merely duplications of those shown, they have been omitted from the drawings and description for the sake of clarity of the drawings.

The invention may be understood most readily by a reference first to a curtain stretcher molding 302 as shown in Figs. 5 and 11. The stretcher molding comprises a longitudinal box-shaped channel having a front face 304, side walls 306 and 308 and an inturned rear stiffening flange 310. A rear face 312 extends laterally from the sidewall 302 and is bent forwardly at 314 and then rearwardly upon itself at 316 to form an inverted substantially U-shaped channel 317. It will be seen that the top or front edge of this channel is closer to the side wall 308 than is the bottom or rear edge. The bight of the U-shaped channel is flattened as at 318 and a longitudinal crimp 320 in the rear face 312 prevents spreading of

the open edge of the channel. As shown in Fig. 11, the finished pin 322 inserted in the channel 317 is provided with a barbed portion 324 adjacent its lower end and with a ball point top 326. Due to the tilted channel 317, the pins are tipped slightly that they best may engage a curtain or other fabric.

Individual moldings 302 as shown in Fig. 2 are fed by hand on to mechanical feeding means which advance them stepwise through a pin setting station 20 (Fig. 1). The moldings are fed in close succession through the pin setting station 20 and are properly timed in their advance therethrough so that holes are pierced in the molding to receive pins at predetermined spaced locations. The pins are formed from wire W which is inserted in the pierced holes and severed and is supplied to the pin forming and setting apparatus at the station 20 from a supply spool which is not shown. From the pin setting station, the moldings 302 are delivered to any desired receiving means.

Aligned with the pin setting station 20 is a feed chain 26 meshed with a sprocket 28 and a sprocket 30. The sprocket 30 is supported directly from a stand 24 while the sprocket 28 is supported by adjustable means subsequently to be disclosed. The stand 24 carries a table 327, bed 328 and an auxiliary bed 330 laterally spaced therefrom. Angle brackets 332 and 334 are secured to the table and auxiliary bed 328 and 330 respectively parallel to the feed chain and in spaced relation to form a guideway 336 for stretcher moldings.

A support bar 338 is secured to the underside of the free end of angle bracket 332 by any suitable means such as screws. Elongated longitudinal slots 340 are provided near the free end of the support bar 338 and screws extend through the slots to support an axle block 344 supporting the axle 32 of sprocket 28. An upstanding flange 346 is secured to the outer end of the axle block 344 and is provided near its upper edge with a set screw 348 abutting the support bar 338. By means of the slots 340 and screws 342 and set screw 346, the axle block 344 may be adjusted in order to keep the feed chain 26 taut at all times. A plurality of lugs 350 are secured to the feed chain 26 at spaced intervals in order to engage the ends of moldings 302 spaced in the guideway 336 on rails 352 to thereby advance the moldings.

A locator flange 354 extends longitudinally substantially the entire length of the bed 328 and is secured thereto at spaced intervals by spacers 356 and screws 358. As molding 302 leaves the guideway 336 it is positioned against the locator flange 354 by means of a guide roller 360 (Figs. 1 and 6). It will be noted in Fig. 6 that the upper or contacting faces of the bed and the auxiliary bed 328 and 330 are inclined so that the tilted channel 317 of the molding 302 may be substantially straight up and down. The guide roller 360 is accordingly provided with a bevelled or angled periphery in order that it may hold the rear face 312 in contact with the supporting face of the bed 328 while maintaining the channel 317 in engagement with the locator flange 354. The guide roller 360 is supported by a stud shaft 362 which is in turn carried by an arm 364 carried by shaft 366 pivotally mounted in a bracket 368 on the table 327. A coil spring 370 circumscribes the shaft 366 to urge the guide roller 360 down against the rear face 312 of the molding and may also urge the roller outward against the channel 317. A finger 372 on the rear end of shaft 366 engages a stop 374 to prevent the roller from moving downward too far when no molding is in place beneath it.

As the molding 302 is further advanced, the channel 317 is positioned and supported by an overlying horizontal flange 376 of an angle bracket 378 secured as by screws to the bed 327. The inner edge of the flange 376 is provided with a relieved portion 379 to provide clearance for a piercer or punch as will be apparent hereinafter. The box-like portion of the molding 302 is supported and located by a flanged wheel 380 (Figs. 4 and 7). The flange 382 on the wheel has a bevelled inner face to engage the sidewall 306 of the molding while the periphery of the wheel 380 is inversely bevelled in order to engage the front wall 304 of the molding. The wheel 380 is mounted for rotation on an arm 384 carried by the shaft 386 pivotally mounted on a bracket 388 on the table 327. A coil spring 390 circumscribes the shaft 386 to maintain the flanged wheel 380 in proper position against the molding 302 while a finger 392 on the butt end of the shaft engages a stop 394 to prevent the wheel from assuming too low a position when no molding is beneath it.

At and adjacent the pin setting station 20, the molding is engaged by a positioning flange 396 (Figs. 4 and 9). The positioning flange 396 is provided with an upset ledge 398 which bears against the inner face of the sidewall 308 of the molding 302. The positioning flange is secured to the table 327 by a pair of bolts 400 fitting through transversely elongated slots 402. Abutments 404 extend upwardly from an edge of the table 327 and are provided with apertures 406 from which coil springs 408 extend to surround locator pins 410 and abut against the edges of the positioning flange 396 to maintain the upset ledge 398 in engagement with the molding 302. It will be noted that the leading and trailing edges of the positioning flange 396 and the locator flange 354 are provided with rounded corners properly to locate the molding. With particular reference to Fig. 9, it will be seen that the auxiliary bed 330 is discontinued throughout the length of the positioning flange 396.

After the molding has passed the pin setting station 20 proper positioning is attained by a second flanged wheel 412 and by the locator flange 354. The flanged wheel 412 is similar to the flanged wheel 380 previously described and is mounted in the same fashion.

Returning now to the sprocket 30 at one end of the driving chain 26, this sprocket is seen to be mounted on a shaft 34 which is connected by a pawl and ratchet mechanism generally designated 36 (Fig. 1) to a reciprocatory link 38. The link 38 is connected to a lever 40 pivotally supported on a stationary wall 42 extending upwardly from the supporting stand or table 24. The lever 40 carries a cam follower 44 that cooperates with a cam 46 mounted on a cam shaft 48. The cam shaft 48 is journalled in bearings on a wall 42 and is driven by a motor which is not shown. Tension springs 49 act on a link 38 to urge the follower 44 against its cam 46. As the cam shaft 48 is rotated the cam 46 acts on the cam follower 44 to reciprocate the links 38. This action is effective through the pawl and ratchet mechanism 36 to impart stepwise movement to the feed chain 26.

Referring to Fig. 1 and particularly to Fig. 8, there is provided at the pin setting station 20 a structure including a stationary portion and sev-

eral vertically reciprocating portions. The stationary portion is supported from the wall 42 by a bracket 88 having a depending leg 90. A bushing 92 is suitably secured as by a press fitting in the leg 90 to guide the wire W downwardly into the movable portion of the pin setting apparatus. A pawl or a dog 94 is pivoted on the leg 90 and has a wire gripping jaw which extends through an aperture 95 in the side of the bushing 92 to engage the wire W. A spring 96 extends between the tail of the pawl 94 and a movable head 98 of the pin setting apparatus. The pawl 94 is so arranged as to prevent upward movement of the wire W while allowing downward movement.

The head 98 is secured to a block 100 slidably mounted on a vertical face of the wall 42 between guide strips 101 on which retaining strips 103 are secured. A pin 102 extends rearwardly from the block 100 through an opening 104 in the wall 42. A tension spring 106 is extended from the pin 102 to a rod 108 threaded through a nut 110 supported by a bracket 112 on the rear face of the wall 42. The tension of the spring 106 is adjustable by threading the nut 110 along the rod 108.

A vertical rod or post 114 extends upwardly from the head 98 to which it is secured. A cam follower (not shown) journalled in the upper end of the rod 114 cooperates with a cam (not shown) on the cam shaft 48. The springs 106 maintain this follower in contact with the cam and rotation of the cam shaft 48 causes the head 98 to reciprocate vertically in timed relation with the stepwise movement of the feed chain 26 so that the head 98 descends during intervals when the chain 26 and the molding 302 carried thereby are stationary. The purpose of this will be explained presently.

A boss 120 on the head 98 is split to afford a clamp in which the upper end of a tubular member or sleeve 122 is held. The sleeve 122 has a lower reduced sleeve portion 124 extending downwardly through a central or axial passageway in a spindle 126 carried by the head 98. The spindle 126 is journalled in ball bearings 127 carried in a sleeve or bushing 128 carried by a split boss or clamp 130 on the hub 98. A pulley 132 is secured on a head portion of the spindle 126 above the boss 130 with the lower face of the pulley 132 riding on the ball bearing 127. A horizontally extending belt 134 is passed around the pulley 132 and around the pulley 136 (Fig. 1) of a motor 138 carried by a bracket 140 on the wall 42. The belt 134 passes from the opening 104 in the wall 42 and is sufficiently elastic to permit vertical reciprocatory movement of the head 98 while the motor 138 remains stationary.

A split clamp 414 having jaws 416 and 418 at its lower end is carried by the head 98 as by screws 420 threaded into the boss 130. The jaws 415 and 418 are clamped together by a screw 422 and hold a punch or piercing member 424. Each time the head 98 descends, the punch 424 passes through the relieved portion 378 of the flange 376 to pierce the flat top 318 of the channel 317 of the molding 302 to form an aperture 426 (Figs. 8 and 10). As may be seen best in Fig. 10, the punch 424 has a downwardly extending tip portion of reduced diameter with a bevelled shoulder 428 to insure that the edge or the aperture 426 will be directed downwardly and inwardly.

A small cylindrical member 142 is carried within the sleeve 122 in the boss 120 and has a central opening through which the wire W is passed. A wire feeding pawl 144 is pivoted on the boss 120 and has a wire gripping jaw extending through an aperture 146 in the cylinder 142 to engage the wire W. A spring 148 extends from the tail of the pawl 144 to the boss 139 on the head 98.

Upon descent of the head 98 the pawl 144 clamps the wire W and forces it downwardly. The lower end of the wire W is driven into the aperture 426 in the molding 302. The wire is slightly larger in diameter than is the aperture 426 so that the wire is firmly gripped by the edges of the aperture and by the side walls of the channel 317. To prevent buckling of the wire intermediate the pawls 94 and 144, the pawl 144 should be positively disengaged from the wire W before the head starts its upward movement. In order to accomplish this, the cylindrical member 142 is mounted on a collar 150 from which depends a tube 152 slidably fitted within the tube 124. A longitudinal wire passageway is formed in the collar 150 and tube 152 and the cylinder 142 is urged upwardly by a coil spring 154 interposed between the collar 150 and the neck of the sleeve 122 where the latter joins the tube 124. A pair of pins 156 extend upwardly from the collar 150 through longitudinal openings in the cylinder 142 and through openings in a circular disc or cover plate 158 above the cylinder 142. A yoke 160 movable relative to the head 98 presses the pins 156 downwardly when the wire W has been imbedded in the molding 302 whereby the cylindrical member 142 is caused to descend a short distance relative to the wire W. As the upper edge of the aperture 146 in the member 142 engages the pawl 144, the pawl is tilted sufficiently to disengage the wire W which allows the pawl to rise without buckling the wire W.

The yoke 160 is pivotally supported by a substantially horizontal U-shaped member 162 having legs straddling the upper portion of the head 98 and secured to vertically extending rods or posts 166. The reduced lower portions 168 of the rods 166 are slidably fitted in apertures extending from the upper part of the head 98. Coil springs 170 are fitted on the lower ends of the rods 166 and are received in sockets 172 in the lower portion of the head 98. Cam followers 174 (Fig. 1) are carried on the upper ends of the rods 166 and cooperate with cams 176 on the cam shaft 48. The springs 172 urge the followers against the cams 176 and also tend to urge the head 98 downwardly against the action of the springs 166 supporting the head. A pair of rods substantially in line with the wire W in Fig. 8 depend from the legs of the yoke 162, pass through clearance openings in the lower part of the head 98, and are threaded into tapped openings in a ring 184 about the lower portion of the sleeve or bushing 128. Ball bearings 186 are disposed in a raceway between the ring 184 and a ring 188 disposed therebelow. The ring 188 is pressed upwardly against the balls 186 by coil springs 190 mounted in sockets in the spindle 126.

A bracket 192 is carried on the bifurcated member 162 and supports the adjusting screw 194. A spring 196 extends between the adjusting screw 194 and the extending tail of the pivoted yoke 160. Downward movement of the bifurcated member 162 continues under the influence of the cams 176 relative to the head 98 when the latter has reached its lower limit of travel. The spring 196 is thereby tensioned to apply force to the end of the yoke 160 engaging the pins 156 to produce the action described

above whereby the feed pawl 184 is in disengaged from the wire W.

Referring to Figs. 1 and 9, there will be seen a rod 200 depending from the bifurcated member 162 and held in an adjusted position by nuts 202 threaded thereon. A cam block 204 (see also Fig. 4) is carried the the lower end of the rod 200 and cooperates with the rear edge of a slide 206 mounted between a pair of blocks 208 and 209 secured to the bed 328. A pin 210 depends from the slide 206 through a slot in the lower block 208 and a spring 212 is extended between the pin 210 and an anchor pin 214 anchored in the table 327. The spring 212 tends to retract the slide 206. A plate 216 is slidably mounted on a pair of studs 218 threaded into the block 208 on either side of the cam block 204. Coil springs 220 placed between the plate 216 and nuts 222 on the studs 218 urge the plate 216 against the rear edge of the cam 204. The spring 212 exerts sufficient force to retract the slide 206 against the action of the springs 220 when the cam 204 is raised.

The wire W is led from its supply spool over suitable guides to pass downwardly through the sleeve 92 (Fig. 8), the cylinder 142, the tube 152, a sleeve 224 at the lower end of the spindle 126 and then to pass between the slide 206 and a finger 226 formed on a plate 228 secured to the block 208. The sleeve 224 is recived in suitable recesses in the lower end of the spindle 126 and in a plate 230 secured thereto and extends through an aperture in a flanged cap 232 secured to the plate 230 by suitable means such as a set screw 234 in the flange of the cap. A set screw 236 in the cap 232 secures the sleeve 224 in position.

The positions of the parts when the head has descended to embed the wire in the molding 302 is shown in Fig. 8 before the bifurcated member 162 has completed its descent. In this figure there is also shown a small cam pin 238 slidably mounted in the lower part of the spindle 126 and having a bevelled edge cooperable with the bevelled edge of a slide 240. The slide 240 is mounted in a horizontal guide way in the bottom face of the spindle 126 and this guide way is lined with strips 242 of hardened steel to minimize wear. A knife 224 having a serrated cutting edge adapted to form and sever the pins 322 is attached to and depends from this slide 240. A pair of pins (not shown) extends from the right end of the slide 240 as seen in Fig. 8 into a pair of corresponding apertures in the block 230 and coil springs in these apertures urge the slide and knife 244 away from the wire W.

When the yoke is depressed by the cams 176 the ring 184 is pushed downwardly by the rods connecting it to the yoke. This causes the ball bearing retaining yoke 188 to move downwardly against its biasing springs 190 to bear upon the upper end of the pin 238. As the pin 238 is forced downwardly it cams the slide 240 to the right as viewed in Fig. 8 until the extremity of the cutting edge of the knife 244 has penetrated the wire W a distance substantially equal to the radius of the wire. As the spindle 126 is rotated continuously by the motor 138 the knife turns about the wire W to form and sever the wire. A portion of the knife 244 forms the upper end of the pin 322, (Fig. 11) substantially into the form of a ball at a given distance from the molding 302. Another portion of the knife 244 forms an anchor portion 324 in the wire W immediately above the preceding pin point 326. The knife 244 also serves to sever the wire between the point and anchor portion of succeeding pins.

As the wire is inserted in the aperture pierced for it in the stretcher molding, and as the wire is formed and severed to form a pin, the cam block 204 (Figs. 4 and 9) is in its lower position where it urges the slide 206 against the wire W. The spring pressed plate 216 moves outwardly against its biasing spring sufficiently to prevent binding of the cam 204. The wire W is clamped between the slide 206 and the finger 226 just above the molding 302 as best may be seen in Fig. 9. As the wire W extends vertically, it fits straight into the channel 317 which is vertical due to the slanting supporting surfaces of the bed 328 and the auxiliary bed 330.

The original setting of a pin in the aperture provided for it, may not leave the pin in exact alignment with the pins set previously. To insure exact alignment, each pin is set not quite all the way in at the first in the pin setting operation and a presser foot 256 (Figs. 1, 8 and 10) is secured to and depends from the slide block 100 to engage the upper end of the pin, to properly align the pin, and to press it to its full depth in the molding. The presser foot is provided with a longitudinal aperture 430 adjacent its lower extremity. This aperture is slightly greater in diameter than each pin 322 and is bevelled as at 432 at its lower edge to insure proper engagement of a pin which is not properly aligned. As shown in the illustrations, the presser foot 256 is located a distance equal to the spacing of three pins from the original pin setting station.

As shown in Fig. 10, each time the head 98 descends an aperture 426 is punched in the flat top surface 318 of the channel 317 of the molding 302. At the same time, the lower end of the wire W, which has an anchor portion formed on its lower end from the last lowering of the head 98, is forced part way into the channel 317 through a previously formed aperture 326 and the presser foot 256 tamps down and aligns a previously inserted pin 322. As specific examples of the relative sizes, each aperture 426 may be .0415 inch in diameter while the wire may by .0420 inch in diameter and the longitudinal aperture 430 in the presser foot 256 may be .0450 inch in diameter. The presser foot inserts the pin an additional $\frac{3}{32}$ inch to its full depth. The wire may be seen to be sufficiently larger than the aperture to be gripped by the edges thereof while not being sufficiently larger to be bent upon insertion therein. Similarly, the longitudinal aperture 430 in the presser foot is sufficiently small properly to align the pins but is large enough to fit loosely and prevent any possibility of binding or jamming.

From the foregoing it will be seen that a novel and useful machine has been provided for forming pins from a wire and concurrently inserting them in a row in a curtain stretcher molding or similar member made of sheet metal or other sheet material presenting a hard surface substantially impenetrable by a wire. Means are disclosed for piercing the curtain stretcher molding or similar member so that the wire readily may be inserted and a novel presser foot is provided for aligning inserted pins and tamping them into their final position. The stretcher moldings or similar members herein acted on are formed of relatively impenetrable flexible material and novel means are provided for feeding

and supporting them without penetrating or marring their surfaces.

It is obvious that various changes may be made in the specific embodiment set forth for purposes of illustration without departing from the spirit of the invention. Accordingly, the invention is not to be limited to the precise details disclosed herein but includes all embodiments thereof that are within the spirit and scope of the appended claims.

I claim:

1. A machine adapted to insert the end of a wire into material not readily pierced thereby and to leave a predeterminedly shaped portion projecting outwardly therefrom, comprising means for forming an aperture in said material, wire handling means to insert the end of said wire into said aperture, and means operable to sever the projecting portion of the inserted wire whereby to leave an inserted partially projecting wire portion, and a longitudinally apertured member to fit over and tamp said projecting portion farther into said material.

2. A machine adapted to insert the end of a wire into material not readily pierced thereby and to leave a predeterminedly shaped portion projecting outwardly therefrom, comprising means for forming an aperture in said material, wire handling means to insert the end of said wire into said aperture, and means operable to sever the projecting portion of the inserted wire whereby to leave an inserted partially projecting wire portion, and a longitudinally apertured member to fit over and tamp said projecting portion farther into said material, the longitudinal aperture of said member having a bevelled mouth whereby to align improperly oriented wire portions.

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The following references are of record in the file of this patent:

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